SOME OBSERVATIONS MADE DURING A ONE DAY *SCUBA* INVESTIGATION OF THE MILLER BLUE HOLE, SANDUSKY COUNTY, OHIO.[1]

On June 23, 1973 the Miller Blue Hole in Townsend Township (Section 9) Sandusky County was visited. This unusual spring has received several investigations in the past: (Wolf, 1931), (Hille, 1955), (Brungs, 1959), (Pinkava, 1963), and (Merlin and Graves, 1971). The purpose of the present investigation was to recover some dead lampreys which were observed along the ledge in about 6 m of water in November, 1972. With permission from Mr. Dan Armbruster, Chief, The Ohio Division of Wildlife; Dr. Kenesaw Shumate, Director of the Water Resource Center, The Ohio State University and I attempted to investigate the bottom of the spring with the aid of SCUBA.

Unfortunately, light penetration was extremely limited with no visible light on the bottom. Even with the aid of underwater diving lights visibility was not increased. The light beam could only penetrate the water column several centimeters. It is postulated that the recent heavy rains had increased the turbulence at the bottom from increased output of the feeder springs and resulted in the decreased light penetration.

A thick, green layer was noted while decending the anchor rope. This layer was concentrated between 2 and 4 m, the lower limit being the extent of light penetration. A sample of the water in the "green layer" was collected and several drops were observed under a microscope. High numbers of the unicellular alga *Chlamydomonas* sp. were observed along with smaller numbers of *Oöcystis* sp. Hille (personal communication) commented that he also observed a population of *Chlamydomonas* sp. in his study of the Miller Blue Hole and that the population appeared to vary in depth distribution with time.

Oxygen and temperature profiles were obtained with a YSI Model 51 oxygen meter and are presented in table 1. It is apparent that oxygen was absent below

TABLE 1

Oxygen/temperature profile, Miller Blue Hole June 23, 1973

Depth (m)	Temp (C)	O_2 (mg/1)
0.0	18.0	7.1
0.5	11.3	7.3
1.0	10.5	1.4
2.0	10.2	1.8
3.0	10.0	0.2
4.0	9.9	0.1
5.0	9.9	0.0
6.0	9.9	0.0
7.0	9.9	0.0
8.0	9.9	0.0
9.0	9.9	0.0
9.5	9.9	0.0

4 m, which ocorresponds with the extent of active photosynthesis of the algal layer. Also, the highest dissolved oxygen readings were found within the zone of greatest temperature (and therefore density) change. This zone may act as a thermal barrier and retard escape of the oxygen. Water chemistries are presented in table 2. Samples were collected and determined in the field with a Hach kit.

[1]Note received November 1, 1973 (73-74).

TABLE 2
Water Chemistry of Miller Blue Hole June 23, 1973

	Surface	2–3 m
pH	7.5	7.2
Total Alkalinity	250 mg/l	264 mg/l
Sulfate	1450 mg/l	1750 mg/l
Hardness	500 mg/l	———
Total Hardness ($CaCO_3$)	1590 mg/l	1550 mg/l
Ca Hardness	1400 mg/l	1500 mg/l

The sulfate readings ranged between 1450–1750 mg/l. The solubility of $CaSO_4 \cdot 2H_2O$ is about 2 grams per liter at 18°C (Ruttner, 1963) and Hutchinson (1957) records an extreme SO_4 reading of 17,176 mg/l from Son-sakesar-kahar, a lake in Punjab, Pakistan. In most inland waters SO_4 concentrations more commonly range between 9–35 mg/l (Reid, 1961). Such high sulfate concentrations undoubtedly resulted from the underlying gypsum deposits in the Miller Blue Hole area.—DONALD K. GARTMAN, *The Ohio Department of Natural Resources, Research Division, Fountain Square, Columbus, Ohio 43224.**

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